

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

November 16, 2004

Ms. Karen Smith
Director
Water Quality Division
Arizona Department of Environmental Quality
1110 W. Washington St.
Phoenix, AZ 85007

Dear Ms. Smith:

Thank you for submitting Arizona's 2004 Section 303(d) list of water quality limited water bodies. EPA carefully reviewed the State's listing submittal dated September 2, 2004, and follow up submittals dated September 9, 2004 and November 2, 2004. EPA commends that State for its strong effort to assemble and evaluate available water quality-related information, and for the clarity with which its assessment findings are presented in the submittal.

Based on our review of the submittal, EPA has determined that Arizona's 2004 list of 53 water quality limited segments (WQLSs) still requiring TMDLs partially meets the requirements of Section 303(d) of the Clean Water Act ("CWA" or "the Act") and EPA's implementing regulations. Therefore, by this order, EPA hereby partially approves and partially disapproves Arizona's 2004 Section 303(d) list. Specifically, EPA approves the State's decision to list the 53 waters and associated pollutants identified in Table 25 of the listing report along with the State's priority rankings for these waters and pollutants. However, EPA disapproves the State's decision not to list 19 additional water bodies, and additional pollutants for 8 waters already listed by the State, because EPA finds that these waters and pollutants meet the federal requirements for listing under Section 303(d). The statutory and regulatory requirements, and a summary of EPA's review of Arizona's compliance with each requirement, are described in the enclosure to this letter.

EPA is identifying for inclusion on Arizona's Section 303(d) list 19 additional water bodies, and additional pollutants for 8 waters already listed by Arizona. The specific waters and pollutants that EPA is adding are identified in the enclosed table. EPA will open a public comment period to receive comments concerning our decision to add waters and pollutants to the State's Section 303(d) list. After we consider comments received from the public, we will transmit the final 2004 Section 303(d) list to you.

EPA identified three situations in which waters and associated pollutants do not attain water quality standards but were not listed on the Section 303(d) list by the State. First, several waters violate narrative water quality standards because fish consumption advisories are currently in effect. Second, available water quality data and information for several waters support a determination that narrative water quality standards are violated due excessive levels of nutrients, turbidity, and/or bottom deposits of sediment. Third, available water quality data

indicate that several waters violate numeric water quality standards for specific pollutants.

EPA has received Arizona's long-term schedule for TMDL development for all waters on the State's 2004 Section 303(d) list. As a policy matter, EPA has requested that States provide such schedules. See Memorandum from Robert Perciasepe, Assistant Administrator for Water, to Regional Administrators and Regional Water Division Directors, "New Policies for Developing and Implementing TMDLs", August 8, 1997. I appreciate that you provided this schedule and look forward to discussing with you the State's future TMDL development plans. EPA is not taking any action to approve or disapprove this schedule pursuant to Section 303(d).

EPA's partial approval and partial disapproval of Arizona's Section 303(d) list extends to all water bodies on the list with the exception of waters within Indian Country, as defined in 18 U.S.C. Section 1151. EPA is taking no action to approve or disapprove the Arizona list with respect to those waters at this time, EPA, or eligible Indian Tribes, as appropriate, will retain responsibilities under Section 303(d) for those waters. EPA's decision to identify additional waters and pollutants for inclusion on the Section 303(d) list does not apply to any waters in Indian Country.

The public participation process sponsored by Arizona Department of Environmental Quality included solicitations of public comment through newspaper advertisements and preparation of a responsiveness summary explaining how the State considered public comment in the final listing decisions.

Thank you for your efforts to develop a sound 303(d) water body list for 2004. If you have questions on any of the above information, please call me at (415) 972-3572 or call Peter Kozelka at (415) 972-3448.

Sincerely yours,

/original signed by/

Alexis Strauss
Director, Water Division

Enclosure

Table 1: Waters added to 303(d) list for Arizona

Description of Table Columns:

“Water body” column identifies the water bodies to be added to the State’s 303(d) list.

“Watershed” column identifies the geographical location of the water body based on State’s designation.

“Water body ID” column specifies the water body segment based on State’s designation.

“Pollutants” column identifies the specific pollutant(s) for which the water bodies were found to exceed water quality standards.

“Basis for Listing” column identifies the basis for individual listing decisions.

“Priority Ranking” column indicates the priority ranking for TMDL development associated with an individual listing decision
(H = High; M = Medium; L = Low priority)

Water Body	Watershed	Water body ID	Pollutants	Basis for listing	Priority ranking
Coors Lake	Bill Williams	AZL 15030204-5000	Mercury	Exceeded narrative water quality standards due to fish consumption advisory	M
Soldier’s Annex Lake	Little Colorado River	AZL 15020008-1430	Mercury	Exceeded narrative water quality standards due to fish consumption advisory	M
Soldier’s Lake	Little Colorado River	AZL 15020008-1440	Mercury	Exceeded narrative water quality standards due to fish consumption advisory	M
Long Lake	Little Colorado River	AZL 15020008-0820	Mercury	Exceeded narrative water quality standards due to fish consumption advisory	M
Lyman Lake	Little Colorado River	AZL 15020001-0850	Mercury	Exceeded narrative water quality standards due to fish consumption advisory	M
Parker Canyon Lake	Upper Gila	AZL 15050301-1040	Mercury	Exceeded narrative water quality standards due to fish consumption advisory	M

Water Body	Watershed	Water body ID	Pollutants	Basis for listing	Priority ranking
Lakeside Lake	Santa Cruz	AZL 15050302-0760	Nitrogen and Phosphorus, Chlorophyll	Exceeded narrative nutrient water quality standards	H
LCR Silver Ck - Carr Wash	Little Colorado River	AZ 15020002-004	Sediment	Exceeded narrative water quality standard	L
Gila River- Bonita Ck - Yuma Wash	Upper Gila	AZ 15040005-022	Sediment	Exceeded narrative water quality standard	L
SF River- Hdwtr - NM border	Upper Gila	AZ 15040004-023	Sediment	Exceeded narrative water quality standard	L
Boulder Creek Unnamed trib–Wilder Creek	Bill Williams	AZ 15030202-006B	Mercury	Exceeded numeric standards for aquatic & wildlife	M
Boulder Creek Wilder Creek–Copper Creek	Bill Williams	AZ 15030202-005A	Mercury	Exceeded numeric standards for aquatic & wildlife	M
Burro Creek Boulder Creek–Black Cyn	Bill Williams	AZ 15030202-004	Mercury	Exceeded numeric standards for aquatic & wildlife	M
Butte Creek hdwtrs—Boulder Creek	Bill Williams	AZ 15030202-163	Mercury	Exceeded numeric standards for aquatic & wildlife	M
Brewery Gulch	San Pedro	AZ 15080301-337	Copper	Exceeded numeric standards for aquatic & wildlife	M
Granite Creek	Verde	AZ 15060202-059A	DO	Exceeded numeric water quality standards	L

Water Body	Watershed	Water body ID	Pollutants	Basis for listing	Priority ranking
Bear Canyon Lake	Little Colorado River	AZL 1502008-0130	pH	Exceeded numeric water quality standards	L
Rose Canyon Lake	Santa Cruz	AZL 15050302-1260	pH	Exceeded numeric water quality standards	L
Watson Lake	Verde	AZL 15060202-1590	Nitrogen, DO, pH	Exceeded numeric water quality standards	M
Tonto Creek hdwtr—unnamed trib	Salt	AZ 15060105-013A	Dissolved Oxygen	Exceeded numeric water quality standards	M
Tonto Creek hdwtr—unnamed trib	Salt	AZ 15060105-013A	Nitrogen	Exceeded numeric water quality standards	M
Tonto Creek unnamed trib—Haigler Cr.	Salt	AZ 15060105-013B	Nitrogen	Exceeded numeric water quality standards	M

Enclosure : Review of Arizona's 2004 Section 303(d) Water body List

Attachment to letter from Alexis Strauss, EPA Region 9 to Karen Smith, Arizona Department of Environmental Quality

Date of Transmittal Letter From State: Aug. 25, 2004

Date of Receipt by EPA: September 2, 2004

Date of Supplemental Transmittals From State: September 9, 2004 and November 2, 2004

Purpose

The purpose of this review document is to describe the rationale for EPA's partial approval and partial disapproval of Arizona's 2004 Section 303(d) water quality limited waters list. The following sections identify those key elements to be included in the list submittal based on the Clean Water Act and EPA regulations. See 40 C.F.R. §130.7. EPA reviewed the methodology used by the State in developing the 303(d) list and the Arizona's description of the data and information it considered. EPA's review of Arizona's 303(d) list is based on EPA's analysis of whether the State reasonably considered existing and readily available water quality-related data and information and identified all waters required to be listed.

Statutory and Regulatory Background**Identification of Water Quality Limited Segments (WQLS) for Inclusion on Section 303(d) List**

Section 303(d)(1) of the Act directs States to identify those waters within its jurisdiction for which effluent limitations required by Section 301(b)(1)(A) and (B) are not stringent enough to implement any applicable water quality standard, and to establish a priority ranking for such waters, taking into account the severity of the pollution and the uses to be made of such waters. The Section 303(d) listing requirement applies to waters impaired by point and/or nonpoint sources, pursuant to EPA's long-standing interpretation of Section 303(d).

EPA regulations provide that States do not need to list waters where the following controls are adequate to implement applicable standards: (1) technology-based effluent limitations required by the Act, (2) more stringent effluent limitations required by federal, State or local authority, and (3) other pollution control requirements required by State, local, or federal authority. See 40 CFR 130.7(b)(1).

Consideration of Existing and Readily Available Water Quality-Related Data and Information

In developing Section 303(d) lists, States are required to assemble and evaluate all existing and readily available water quality-related data and information, including, at a minimum, consideration of existing and readily available data and information about the

following categories of waters: (1) waters identified as partially meeting or not meeting designated uses, or as threatened, in the State's most recent Section 305(b) report; (2) waters for which dilution calculations or predictive modeling indicate nonattainment of applicable standards; (3) waters for which water quality problems have been reported by governmental agencies, members of the public, or academic institutions; and (4) waters identified as impaired or threatened in any Section 319 nonpoint assessment submitted to EPA. See 40 CFR 130.7(b)(5). In addition to these minimum categories, States are required to consider any other data and information that is existing and readily available. EPA's 1991 Guidance for Water Quality-Based Decisions describes categories of water quality-related data and information that may be existing and readily available. See EPA 1991, Appendix C. While States are required to evaluate all existing and readily available water quality-related data and information, States may decide to rely or not rely on particular data or information in determining whether to list particular waters.

In addition to requiring States to assemble and evaluate all existing and readily available water quality-related data and information, EPA regulations at 40 CFR 130.7(b)(6) require States to include as part of their submissions to EPA documentation to support decisions to rely or not rely on particular data and information and decisions to list or not list waters. Such documentation needs to include, at a minimum, the following information: (1) a description of the methodology used to develop the list; (2) a description of the data and information used to identify waters; and (3) any other reasonable information requested by EPA Region IX.

Priority Ranking

EPA regulations also codify and interpret the requirement in Section 303(d)(1)(A) of the Act that States establish a priority ranking for listed waters. The regulations at 40 CFR 130.7(b)(4) require States to prioritize waters on their Section 303(d) lists for TMDL development, and also to identify those WQLSs targeted for TMDL development in the next two years. In prioritizing and targeting waters, States must, at a minimum, take into account the severity of the pollution and the uses to be made of such waters. See Section 303(d)(1)(A). As long as these factors are taken into account, the Act provides that States establish priorities. States may consider other factors relevant to prioritizing waters for TMDL development, including immediate programmatic needs, vulnerability of particular waters as aquatic habitats, recreational, economic, and aesthetic importance of particular waters, degree of public interest and support, and State or national policies and priorities. See 57 FR 33040, 33045 (July 24, 1992), and EPA 1991.

Analysis of Arizona's Submission

EPA has reviewed the State's submission and has concluded that the State developed its Section 303(d) list in partial compliance with Section 303(d) of the Act and 40 CFR 130.7. Because Arizona's submission does not include all waters that meet Section 303(d) listing requirements, its list will be partially approved and partially disapproved, and the additional waters and pollutants that meet the listing requirements will be added to the final 2004 list. EPA's review is based on its analysis of whether the State reasonably considered existing and

readily available water quality-related data and information and identified all waters required to be listed.

EPA's Review of Arizona's Listing Assessment

In July 2000, Arizona enacted a statute governing its identification of impaired waters. See A.R.S. §49-232; A.A.C. R18-11-601 *et seq.* The State later adopted rules specifying its Section 303(d) assessment methodology. The rule and associated methodology provide that the State can consider only reasonably current credible and scientifically defensible data (A.R.S. §49-232.B), and that results of water sampling or other assessments of water quality shall be considered credible and scientifically defensible only if ADEQ has determined that each of several criteria set forth in the statute have been met (A.R.S. §49-232.B. (1 - 4)). Arizona determined that available data were unreliable in very few cases as part of its 2004 assessment. See ADEQ 2004 Technical Support Documentation, p. 8. EPA carefully reviewed the State's consideration of data quality in each of these cases and finds that the State's decision not to rely upon these excluded data sets was reasonable because the State identified legitimate problems with the data in question. In both cases, the State had supplemental monitoring data that supplied evidence that applicable standards were being attained for these waters.

ADEQ's rules establish data conventions that ADEQ uses to interpret data for its impaired water identifications (R18-11-603.A.), and identifies data that ADEQ shall not use for placing a water on its 303(d) list (R18-11-603.B). ADEQ's rules also identify conditions under which the State may not place a surface water or segment on its 303(d) list. See R18-11-604.C.1 (related to pollutant loadings from naturally occurring conditions), C.2 (related to data collected within a mixing zone or "under a variance or nutrient waiver"), and C.3 (related to activities or conditions regarding, e.g., canal and dam maintenance). EPA carefully reviewed the State's application of these provisions in the 2004 listing process and found that they were applied consistent with applicable State water quality standards.

ADEQ's rules also establish that, when evaluating a surface water or segment for placement on the 303(d) list, ADEQ must consider at least 20 spatially or temporally independent samples collected over three or more temporally independent sampling events (R18-11-605D.1), unless alternative listing criteria set forth in R18-11-605D.2 are satisfied. As explained below, EPA has determined that sufficient data were available for several waters with less than 20 samples to support a conclusion that several waters and pollutants not listed by the State violate State water quality standards and therefore meet federal listing requirements.

ADEQ based its 2004 Section 303(d) submittal almost entirely on its review of surface water quality data collected during the five-year period beginning January 1998 and ending December 2002 (ADEQ 2004, p. III-1). EPA finds it reasonable for the State to make its assessment based on water quality data collected during this timeframe because the more recent ambient water quality data are more likely to be representative and indicative of current water quality conditions. EPA notes, however, that it may be reasonable to consider sediment and tissue data that are older than five years in age because these types of data often change more slowly than ambient water column data and provide reliable information for assessing water quality conditions for a longer period of time. As discussed below, EPA considered some older

data concerning fish consumption advisories in its evaluation of the State submittal. ADEQ requested data from federal and state agencies, universities, and volunteer monitoring groups, and compiled data from ADEQ's permit compliance, enforcement and remediation programs.

EPA has reviewed Arizona's description of the data and information it considered, its methodology for identifying waters, and the State's responsive summary. EPA concludes that the State's decisions to list the waters and pollutants identified in Table 25 of its listing submittal are consistent with federal listing requirements. EPA's decision to approve these listings does not mean that EPA concurs with or is taking any action with respect to the State's listing methodology. EPA considered the State methodology in its decision to approve the waters and pollutants listed by the State. However, EPA also reviewed the data and information provided by the State as part of its listing submittal to determine whether the State listed all waters or pollutants that do not attain State water quality standards and meet federal listing requirements. EPA concludes that the State's decision not to list several waters and pollutants is not consistent with federal listing requirements. As discussed below, the available data and information are sufficient to support a conclusion that these waters are water quality limited and need to be listed pursuant to Section 303(d).

Except as noted below, the State was diligent in compiling data and completed a good synthesis of individual monitoring data for each water body (ADEQ 2004). ADEQ reviewed the data to determine if it met requirements established in the State's statute and rules related to the identification of impaired waters. Arizona compiled its 2004 Section 303(d) list based almost entirely on evaluation of water chemistry data only. The State did not carefully evaluate other types of monitoring data and information—bottom deposits, sediment contamination, bioassessments, physical integrity, fish kills and fish tissue for Section 303(d) listing purposes based on the rationale that its rules precluded their application absent approved water quality standards implementation procedures for narrative standards. As explained below, EPA has determined that these other types of data and information (i.e., fish consumption advisories, fish kills, and surrogate suspended sediment data) support a conclusion that several waters and pollutants not listed by the State violate State water quality standards and therefore meet federal listing requirements.

Arizona applied different methods for considering whether numeric water quality standards were exceeded depending upon whether available data were available for toxic pollutants or other pollutant types. In general, the State required fewer water quality standards exceedences in order to list toxic pollutants than it did to list other pollutant types. The State listed toxic pollutants in cases where more than 1 sample exceeded the applicable numeric standard in any three-year period. This approach is consistent with EPA's 1997 and 2003 assessment guidance documents and State water quality standards. EPA concludes that nearly all the State's toxic pollutant listing decisions on this basis are consistent with federal listing requirements. However, in a few cases discussed below, available data supports the conclusion that chronic water quality standards for mercury and copper are also violated and these waters should be listed.

The State required a higher rate of standards exceedences in order to list other types of pollutants (referred to here as conventional pollutants). The State listed waters in cases where

there was greater than 90% statistical confidence that a numeric standard for a conventional pollutant was exceeded at least 10% of the time (i.e., the so-called “binomial” approach). EPA questioned the analytical basis for this approach in our comments on the 2004 draft list as well as the 2002 list and impaired waters rule that codified this decision rule. EPA explained that ADEQ mis-interpreted EPA’s 1997 and 2003 assessment guidance and the 10% “raw score” approach regarding conventional pollutants. The State should not have considered this 10% as the allowable exceedence rate for many conventional pollutants because it is inconsistent with State water quality standards and therefore inappropriate for assessing these conventional pollutants.

For conventional pollutants, the State required a minimum sample size of 20 independent samples in order to support a listing determination. In our comments on the 2004 and 2002 listing decisions and the impaired waters rule, EPA expressed concern about the use of minimum sample sizes. Application of a 20-sample minimum could result in an assessment that missed waters that are highly likely to exceed applicable water quality standards. For example, the State did not identify Granite Creek on its Section 303(d) list although 5 out of 7 independent dissolved oxygen samples were in violation of the applicable water quality standards. This water was not listed by the State because the minimum sample size threshold was not met. However, under the State’s listing methodology, this water would have been listed if 20 samples had been available, because the listing criteria established under the State’s “binomial” approach would have been met (i.e., 5 exceedences in 20 samples yields greater than 90% statistical confidence that the standard is exceeded more than 10% of the time). Since the State’s assessment methodology for conventional pollutants has not been modified, EPA concludes that the State’s decision not to list several waters with less than 20 samples available was inconsistent with federal listing requirements because these waters had a sufficient number of standards exceedences to support a reliable conclusion that applicable standards are being exceeded.

EPA also evaluated waterbodies with larger data sets (more than 20 samples) for conventional pollutants to determine whether applicable water quality standards were exceeded. As discussed below, EPA concluded that available data were sufficient to support the conclusion that dissolved oxygen standards in one segment of Tonto Creek are violated.

In its 2004 list, the State retained most of the waters added by EPA to the State’s 2002 Section 303(d) list. The one water listed by EPA in 2002 that was dropped from the 2004 list was Granite Basin Lake, for which available data showed water quality standards are now attained.

The State properly listed waters with nonpoint sources causing or expected to cause impairment, consistent with Section 303(d) and EPA guidance. Section 303(d) lists are to include all WQLSs still needing TMDLs, regardless of whether the source of the impairment is a point and/or nonpoint source. EPA’s long-standing interpretation is that Section 303(d) applies to waters impacted by point and/or nonpoint sources. In *Pronsolino v. Marcus*, the District Court for the Northern District of California held that section 303(d) of the Clean Water Act (CWA) authorizes EPA to identify and establish total maximum daily loads (TMDLs) for waters impaired by nonpoint sources. *Pronsolino v. Marcus*, 91 F.Supp.2d 1337, 1347 (N.D.Ca. 2000). See also EPA’s 1991a; National Guidance for 1998 Section 303(d) Lists, Aug. 27, 1997.

Basis for EPA Decisions to Add Waters To Arizona's List

This section describes the basis for EPA's decisions to (1) disapprove the State's decision to not list several water bodies and/or pollutants for currently listed water bodies, and (2) identify these water bodies for inclusion on the final 2004 Section 303(d) list with associated priority rankings.

Narrative Standards

To date, Arizona has not completed nor adopted implementation procedures for its narrative water quality standards. A State statute bars ADEQ from listing waters identified as impaired due to violations of narrative standards until these implementation procedures have been adopted. Federal regulations at 40 CFR 130.7(b)(3) provide that states must consider potential exceedences of all applicable water quality standards, including designated beneficial uses, numeric and narrative criteria, and antidegradation requirements. Although it is helpful for States to adopt implementation procedures to aid in application of narrative water quality standards, federal regulations do not make their adoption and approval a precondition of their application in the Section 303(d) list assessment process. EPA concludes that Arizona did not provide a reasonable rationale for not considering listings due to potential exceedences of narrative standards absent approved implementation procedures. Therefore, EPA carefully reviewed available information in the record provided by the State to determine whether any waters violated narrative standards and should be included on the Section 303(d) list. EPA found that several waters do not attain narrative water quality standards and must be listed.

Violations Based Upon Fish Consumption Advisories

As discussed in the previous section, EPA added several waters to the 2002 Arizona Section 303(d) list because fish consumption advisories were in effect. The State properly included these waters on the 2004 Section 303(d) list, along with Alamo Lake, which was listed by EPA in 2002 but for which a consumption advisory was subsequently issued by the State. Since the 2002 303(d) submittal, the State has issued fish consumption advisories for additional waters due to the presence of mercury. Each of these advisories was based on analysis of locally collected fish tissue data and application of risk levels consistent with those applied in developing State water quality standards. These advisories provide evidence that the fish consumption use is impaired in each of these waters. Consistent with EPA's national guidance (EPA, 2000), EPA finds that the following waters with fish consumption advisories meet federal listing requirements: Coors Lake, Long Lake, Parker Canyon Lake, Soldiers' Lake and Soldiers' Annex Lake.

Exceedences Based Upon Nutrient, Turbidity, and Sediment Data

In our review of the State submittal, we identified several waters for which water quality data were available but which the State did not consider listings because neither numeric water quality standards nor narrative standard implementation procedures were available to guide the assessment. The Impaired Waters Rule does not authorize the State to consider listing in these circumstances. However, as discussed above, federal regulations require the State to consider all

available data and information and to consider possible violations of all applicable water quality standards, including narrative standards for which implementation procedures have not yet been adopted by the State.

EPA applied a weight of evidence approach to evaluate available data in these situations to determine whether narrative water quality standards were violated. The weight of evidence approach considers multiple environmental indicators, including biological, toxicological, physical and chemical measurements and any other water quality related information. For the waters of concern in Arizona, our evaluations focused upon waters for which nutrient, turbidity, and sediment data were available. EPA identified reasonable evaluation guidelines that could be applied to determine whether available data supported findings that specific narrative water quality standards were violated. EPA then compared the available data to these guidelines, considering the number, frequency, and magnitude of sample excursions above these guideline values for each indicator.

Assessments Based on Narrative Nutrient Standards

For Lakeside Lake, EPA examined 2002 and 2003 water quality data and found sufficient evidence indicating that narrative nutrient standards at A.A.C. R18-11-108 are exceeded. Specifically, the annual mean values for total nitrogen, total phosphorus and chlorophyll *a* exceeded EPA guidance values for eutrophic lakes (1999a). Therefore EPA added nitrogen, phosphorus and chlorophyll *a* to the list of pollutants that ADEQ had already identified as impairment causes for Lakeside Lake (dissolved oxygen and ammonia).

Assessment of Narrative Standards Effects Associated with Sediment and Turbidity

As part of its 2004 assessment, ADEQ evaluated suspended sediment concentrations (SSC) for a few waters for which SSC monitoring data and stream flow records were available as required by the State rule for this numeric standard, and listed four segments due to SSC violations. Since the SSC standard is relatively new and very little SSC data was available for comparison with this numeric standard, ADEQ did not assess many streams across the state for effects associated with excessive sediments. Also, the SSC standard applies only during base flow conditions, it essentially neglects assessment of excessive sedimentation during high flow conditions, possibly resulting in not identifying waters impaired during all stream flow levels. See A.A.C. R18-11-109(D) or TSD, pg. 19. The State's submittal provided turbidity summaries of monitoring results, concluding that assessments based on these data were "inconclusive." However, the State did not evaluate whether available SSC or turbidity data were sufficient to support conclusions that the narrative water quality standards, particularly concerning bottom deposits, were violated.

EPA examined available data for turbidity and SSC in comparison to narrative water quality standards, specifically the bottom deposits standard. The bottom deposits narrative standard states that "a surface water shall be free of pollutants in amounts or combination that settle to form bottom deposits that inhibit or prohibit habitation, growth, or propagation of aquatic life or that impair recreational uses" (A.A.C. R18-11-108). EPA determined that it is appropriate to evaluate turbidity and SSC data as potential indicators of adverse effects

associated with bottom deposits in streams. Many studies have demonstrated that turbidity can serve as an accurate indicator of suspended sediment levels in streams (e.g., Lewis, 2002; Uhrich, 2002; Warner, 2002; EPA, 1999b; EPA 1991b). As described below, EPA found a good correlation for these two parameters in AZ streams, indicating that turbidity data may serve as a reliable surrogate for SSC. Studies of sediments in streams have also shown that streams that carry excessive suspended sediment loads also tend to experience excessive levels of sediment deposition in response reaches, often at levels that cause adverse effects on fish habitat (EPA, 1991, Rosgen, 1996, Spence, *et. al*, 1996).

EPA also evaluated potential adverse effects of high turbidity and SSC levels on the aquatic and wildlife designated use (A.A.C. R18-11-101), which is a component of the water quality standards to be assessed as part of the Section 303(d) listing update. See 40 CFR 130.7(b)(3). EPA judged that it is appropriate to use turbidity and SSC data to consider possible adverse effects on the aquatic and wildlife beneficial use associated with direct exposures of fish. Scientific studies have documented that excessive sediment is likely to create adverse impacts on aquatic organisms, including lethal and sub-lethal effects (EPA, 1999b; Waters, 1995). Excessive sediment can create other adverse effects in fish such as: reduction in feeding rate and feeding success, physiological stress, moderate habitat degradation, and impaired homing (Newcombe and Jensen, 1996).

As mentioned above, EPA evaluated Arizona turbidity monitoring results from more than 20 waterbodies and a small subset of sediment studies therein contained both SSC and turbidity measurement collected side-by-side. We investigated paired turbidity and SSC data for several warm water streams and generated logarithmic plots of SSC vs. turbidity to determine there was very good correlation ($r^2 = 0.848$) between these two parameters (EPA, 2004). This direct relationship indicating that elevated turbidity measurements correspond to higher suspended sediment levels has been reported by other researchers and utilized in some TMDLs (Christensen, *et al.* 2002; Lewis, 2002; ADEQ Little Colorado River TMDL, 2002; NM Cieneguilla TMDL, 2004). Using equations from the log-log plots, we determined the existing SSC standard (80mg/L) corresponds to a turbidity value of 25 NTU. To establish a screening guideline to assess available data for the 2004 assessment, we judged that it is appropriate to select a guideline value higher than this calculated turbidity value to account for the fact that turbidity is not a perfect surrogate for SSC in all Arizona streams. We increased the calculated turbidity value by factor of two to accommodate this source of uncertainty; this yielded a turbidity assessment guideline of 50 NTU that we used to perform assessments of warm water streams. This value is consistent with EPA turbidity criteria (1986) as well as the pre-existing State turbidity standard for warm streams.

Paired SSC and turbidity data did not exist for cold water streams in Arizona; nonetheless it was necessary to complete assessments for these types of waterbodies to identify potential impacts due to sediments on coldwater fish species. Most importantly, native coldwater fish species may be more sensitive to the effects of high sediment levels to warmer water conditions (with lower oxygen levels) necessitating increased respiration and metabolic rates and increase likelihood of gill abrasion from excessive sediment (US FWS, 2004). EPA used a turbidity guideline of 10 NTU for coldwater streams, consistent with EPA criteria (1986) and the pre-existing State standard for cold water streams.

EPA also evaluated turbidity data for several Arizona lakes. We considered the possibility that narrative bottom deposit standards applicable to lakes and reservoirs might be violated, although we recognize that turbidity measurements in such water systems may be confounded due to multiple sources; e.g., suspended sediment, algae and other matter. Without a reliable means of either directly correlating SSC to turbidity in lakes or differentiating the contribution from each source mentioned above, we applied a higher value to adjust for uncertainty (3 fold) to produce turbidity guidelines of 75 NTU for warm water lakes and 30 NTU for coldwater lakes.

After developing these screening guidelines, EPA completed a weight of evidence analysis of each water body based on available turbidity and SSC monitoring data. We considered the number, frequency, and magnitude of excursions above the EPA guidelines discussed above, related biological information (such as presence of threatened or endangered aquatic species), and other information (e.g., land use changes, etc.). This waterbody-by-waterbody analysis is summarized in EPA, 2004; while Appendix A provides the conclusive results for waters being added to Arizona's list. EPA is identifying 3 additional waters for inclusion on the Section 303(d) list based on exceedences of the narrative bottom deposit standard: Little Colorado River—Silver Creek to Carr Wash, Gila River—Bonita Creek to Yuma Wash, San Francisco River—headwaters to New Mexico border.

Numeric Standards

As discussed above, EPA concluded that the State's decision not to list some waters and pollutants due to exceedences of numeric water quality standards for various pollutants is inconsistent with State water quality standards and federal listing requirements. EPA identified several waters for which sufficient data were available to support the conclusion that State water quality standards were exceeded. For five water bodies, chronic aquatic and wildlife standards were exceeded for either aqueous mercury or copper. For four waters, available data demonstrated water quality standard violations even though minimum sample size requirements set by the State impaired waters rule were not met. Finally, data for one water body demonstrated exceedences of the applicable nitrogen water quality standard. EPA is adding each of these waters to Arizona's list.

Assessment of Chronic Standards Exceedences for Toxic Pollutants

EPA reviewed the State's assessment of toxic pollutants in comparison with applicable chronic standards to protect aquatic life. ADEQ assessed and included on its 303(d) list numerous water bodies in cases where two or more exceedences of numeric chronic standards were identified. EPA is approving those listing decisions. However, several other waters and pollutants were not included on the State's 303(d) list although the chronic standards were exceeded two or more times during the period of assessment: Boulder Creek (2 segments) Burro Creek, Butte Creek (all for mercury) and Brewery Gulch (copper). EPA has determined that these waters meet federal (and State) listing requirements. See 40 CFR 130.7(b); A.A.C. R18-11-605 (D)(2)(b) and TSD, pg. 18.

To support this determination, EPA carefully reviewed all the available data, including total and dissolved data and sediment data for these segments. With respect to the mercury listings, most of the available data was collected by Phelps Dodge, Inc., which operates mining facilities in the vicinity of these water bodies. We noted that in some cases, sampling data for some dates indicated that total mercury levels were reported as non-detects while dissolved mercury levels were reported to exceed the applicable chronic mercury standard for aquatic and wildlife protection. Before deciding to rely upon the dissolved mercury data to assess these waters, we carefully considered whether the data were reliable. We reviewed the quality assurance information provided by the State with these data and found that all the data were collected pursuant to State and EPA-approved quality assurance plans and there was no evidence of laboratory error in the meta-data. We concluded that it would be reasonable to consider these data in the assessment, with the caveat that there was some evidence that they may not be completely reliable. This conclusion was based on the considerations that (1) federal regulations require the assembly and evaluation of all available water quality-related data (40 CFR 130.7(b)(5)), (2) ADEQ applies rigorous quality assurance procedures as part of its listing assessment, (3) ADEQ's submittal indicates that the State determined that the dissolved mercury data for these waters is of sufficient quality to support an assessment, and (4) there were supporting data collected by ADEQ to analyze both for water column and sediment mercury levels.

EPA evaluated these data through a weight of evidence approach that considered the number of dissolved mercury excursions above applicable chronic and acute water quality standards, the number of sediment samples that indicated mercury levels higher than recommended guidelines, and the magnitude of excursions of both dissolved and sediment mercury levels. In evaluating potential chronic standards exceedences, EPA applied the methodology specified in the State's Impaired Waters Rule and used by ADEQ for applying chronic standards for other waters (A.A.C. R18-11-605 (D)(2)(b); TSD pg. 18). This method calls for the identification of waters as impaired if 2 or more independent samples exceed chronic aquatic and wildlife standards in any assessment period. This approach is consistent with EPA assessment guidance (EPA, 1997; EPA, 2001). EPA concludes, based on this analysis, that available data are sufficient to support the conclusion that these waters are impaired due to mercury.

We note that at least one party that commented on the State's draft listing decision suggested that the State should compare chronic toxics standards against the average of the 4 most recent samples for that pollutant in a particular sampling location, based on a suggested interpretation of A.A.C. R18-11-120. We note that the cited section of the Arizona water quality standards applies to provisions for applying standards in enforcement actions. Section 303(d) listing decisions are not enforcement actions, and ADEQ and EPA believe that the provisions of A.A.C. R18-11-120 do not apply to the application of chronic toxics standards for development of the Section 303(d) list. We also note that the State of Arizona conducts follow-up monitoring to verify Section 303(d) listings prior to adopting TMDLs; therefore, it is likely and reasonable in this case for additional monitoring to be conducted prior to completing TMDLs to address these listings.

Assessment of Other Numeric Water Quality Standards

EPA also carefully reviewed ADEQ's assessments of conventional pollutants in waters for which less than 20 samples were available. As discussed above, the State did not consider listing these waters because the Impaired Waters Rule did not authorize the State to list conventional pollutants in cases where fewer than 20 samples were available. EPA found that the following waters exceed applicable water quality standards in 71-100% of available samples: Bear Canyon Lake, Granite Creek, and Rose Canyon Lake. Appendix A (attached) summarizes the results for each water body. A finding that these waters do not attain the applicable standards is consistent with EPA's 1997 and 2004 assessment guidance documents with respect to conventional pollutant assessments as well as applicable Arizona water quality standards. Therefore, EPA determined that these waters meet federal listing requirements.

For Watson Lake, available data indicated the lake is impaired due to excessive nitrogen, elevated pH and low dissolved oxygen. Between 20% and 40% of available results for all three pollutants were above State designated numeric water quality standards for this tributary to Verde River (A.A.C. R18-11-109 (F)(1)), along with records of a recent fish kill event. Whereas the State has deemed each data set too small for consideration, EPA assessed the results via the weight of evidence approach; that is, the sum of these multiple lines of evidence indicate conditions of impairment and support listing this water body.

EPA evaluated the State's assessment of waters in cases where more than 20 samples were available and the data indicated numerous excursions above the applicable numeric water quality standards. EPA concluded there were sufficient data to support the conclusion that the dissolved oxygen standard was exceeded (12%) in one segment of Tonto Creek.

EPA identified Tonto Creek (two segments) was not listed by the State for which there was sufficient conventional pollutant data to support listing for nitrogen. ADEQ has established specific numeric water quality standards for Tonto Creek (A.A.C. R18-11-101(6)). These include annual mean standards and single sample maximum standards that apply to total nitrogen concentrations. EPA found multiple violations of the annual mean standard in the upper segment and exceedences of both numeric standards in the lower segment; thus, we concluded that these two segments of Tonto Creek are impaired due to nitrogen.

Good Cause for Delisting

Arizona did not include on its 2004 Section 303(d) list several waters included on the 2002 list, and EPA asked the State to provide rationales for its decisions not to list several previously listed waters. The State has demonstrated, to EPA's satisfaction, good cause for not listing these waters, as provided in 40 CFR 130.7(b)(6)(iv).

Arizona did not include 34 water bodies on the 303(d) list because analysis of available monitoring data supported a conclusion that applicable standards were no long exceeded. See ADEQ's submittal, Table 30. EPA concurs with these proposed delistings except for those waterbody/pollutant combinations listed above where EPA found sufficient evidence of narrative

water quality standard violations for sediments.

For Miller Springs Canyon and the Paria River, the State concluded that selenium measurements collected by other parties did not meet appropriate quality control and quality assurance levels. Water data supplied by BHP for Miller Springs Canyon and by Northern Arizona University for the Paria River included false positive results and the state properly concluded that these data were unreliable. Furthermore, for the Paria, additional Se samples analyzed by the State's laboratory showed that the Paria is currently attaining numeric standards.

Granite Basin Lake was listed in 2002 for dissolved oxygen. The State's continued investigation of Granite Basin Lake indicated that dissolved oxygen exceedences were due to natural conditions associated with lake turnover. Sonoita Creek dissolved oxygen problems were considered a natural phenomenon and a result of low oxygen input from groundwater upwelling. ADEQ provided sufficient documentation supporting these natural source determinations in both cases. Because State water quality standards provide a natural source exclusion, the State's decision to not list these waters is consistent with applicable water quality standards.

East Verde River was not included on the state's draft list, although EPA noted there were 7 of 23 exceedences of the total arsenic numeric standard for this water body. The State explained that arsenic concentrations are high in this surface water body due to groundwater upwelling in this area. However, the arsenic levels decline when water is added via inter-basin transfer from East Clear Creek, which typically occurs. In this case, EPA concurs with the State's conclusion that the measured arsenic levels are due to natural conditions and that the water need not be listed based on the natural source exclusion.

EPA requested a more detailed rationale to support the State's decision not to list Grande Wash—headwaters to Ashbrook Wash, which ADEQ placed in Category 4B. The State reported that *E. coli* levels in the wash were declining due to changes in methods used by the Fountain Hills WWTP to manage wastewater. The treatment plant had been discharging into the wash until October 2000 and then switched to groundwater recharge, thereby eliminating discharge into the wash. *E. coli* levels are expected to attain standards before the next list assessment in 2006. The State and/or the treatment plant will continue to monitor bacteria levels in the wash (when water exists) to verify that water quality exceedences have been resolved. (ADEQ 2004, pg. IV-219). EPA reviewed the State's supporting information and concurs with the State's conclusion that Grande Wash need not be included on the Section 303(d) list.

Consistent with EPA's 1997 Integrated Reporting Guidance, Arizona submitted an integrated report (i.e., combining the Section 305(b) report and Section 303(d) list. Consistent with the EPA guidance, Arizona did not include on the Section 303(d) list waters (Part 5 of the Integrated Report) for which TMDLs have been completed and either approved or established by EPA.

Public Comments

ADEQ provided opportunity for public comments on their draft lists (November 2003 and May 2004). As part of their submittal, ADEQ provided a responsiveness summary that addressed public comments concerning both draft lists. Phelps Dodge, Inc. filed an appeal of ADEQ's decisions to list four water bodies in Boulder Creek watershed for aqueous mercury exceedences of chronic numeric standards. In its final list submittal to EPA, ADEQ did not include these four waters on the Section 303(d) list.

Among the public comments regarding the State's 303(d) list, several overriding issues were of interest to EPA. Concerns were raised about the State's assessments based on the chronic numeric standards for the aquatic and wildlife designated use. The State responded that its listing methodology for toxic pollutants was consistent with the State-established standards. Regarding concerns raised about listing waters due in part to naturally occurring conditions, the State clarified that listing is warranted, except when exceedences are due solely to natural conditions with no anthropogenic contributions (A.R.S. 849-232(D)). Several commenters urged the State to not list Lakeside Lake as technology-based controls had recently been installed and the assessment was based on older data collected prior to the installation of the new controls. The State's response indicated that it carefully scrutinized both the older data and the newer 2003 data and found significant exceedences of numeric standards to support listing for dissolved oxygen and ammonia. Comments were also raised about adding waters to the State's planning list, and the State reiterated that their Planning list does not equate to the 303(d) list. One comment expressed dissatisfaction with continued listing of the Salt River (near 24th Ave. WWTP) for organochlorine compounds. The State described how it established a fish consumption advisory for the lower Gila River (including 24th Ave. portion). The advisory was based on analysis of fish tissue data collected from this water body segment in 1995 and 1997 using risk assessment parameters equal to or less restrictive than those assumptions used to develop water quality standards. The State's procedures for developing fish advisories are consistent with EPA guidance (2000) for using fish advisories to support 303(d) listings.

Priority Ranking and Targeting

EPA reviewed Arizona's priority ranking of listed waters for TMDL development, and concludes the State properly took into account appropriate ranking factors to make its determination. The State's elaborate decision process for ranking the listed waters is established in the Impaired Waters Rule and includes numerous relevant factors: magnitude and duration of the exceedence, designated beneficial uses, imminent harm to public health or wildlife, jeopardy to threatened and endangered species, impairment of (State designated) "unique waters", degree of public interest, recreational and economic significance, anticipated revision of NPDES or AZPDES permit for discharge to impaired water body. Arizona also considers whether the water body has been on the list an extensive length of time, whether more than one designated use is impaired and whether seasonal conditions are contributing to the impairment.

EPA concludes that the State properly considered those factors required to be considered by Section 303(d) and applied a reasonable set of additional ranking factors, consistent with the priority ranking provisions of 40 CFR 130.7(b).

EPA reviewed the State's identification of water quality limited segments targeted for TMDL development in the next two years and concludes that the targeted waters (high priority) are appropriate for TMDL development in this time frame. High priority waters include: Alamo Lake, Upper Lake Mary, Lakeside Lake, French Creek—headwaters to Hassayampa, Turkey Creek—unnamed tributary to Poland Creek, Pinto Creek—Ripper Spring to Roosevelt Lake. The State has targeted an appropriate mix of complex and relatively simple TMDLs addressing both point and nonpoint sources.

For those waters and pollutants added to the list by EPA, priority rankings are provided in Table 1. In general, EPA considered the ranking factors applied by Arizona and the existing State ranking for similar water-pollutant combinations in making ranking decisions. Lakeside Lake has received a high priority ranking to be consistent with ADEQ's ranking for this waterbody. EPA set medium priority rankings for other waters with mercury consumption advisories to be consistent with most State rankings for waters impaired by mercury. The remaining waters added by EPA are assigned low priority rankings because available information indicates the severity of the impairments to these waters is lower than in other listed waters.

Administrative Record Supporting This Action

In support of this decision to approve the Arizona's listing decisions, EPA carefully reviewed the materials submitted by Arizona with its 303(d) listing decision. The administrative record supporting EPA's decision is comprised of the materials submitted by the State, copies of Section 303(d), associated federal regulations, and EPA guidance concerning preparation of Section 303(d) lists, and this decision letter and supporting report. EPA determined that the materials provided by the State with its submittal provided sufficient documentation to support our analysis and findings that the State listing decisions meet the requirements of the Clean Water Act and associated federal regulations. We are aware that the State compiled and considered additional materials (e.g. raw data and water quality analysis reports) as part of its list development process that were not included in the materials submitted to EPA. EPA did not consider all these additional materials as part of its review of the listing submission. It was unnecessary for EPA to consider all of the materials considered by the State in order to determine that, based on the materials submitted to EPA by the State, the State complied with the applicable federal listing requirements. Moreover, federal regulations do not require the State to submit all data and information considered as part of the listing submission.

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Appendix A. Waterbody-Pollutant assessment worksheet

Waterbody	Criteria	Summary of results	Other info	Biological info
Coors Lake		Fish consumption advisory posted		
Soldier's Lake		Fish consumption advisory posted		
Soldier's Lake Annex		Fish consumption advisory posted		
Long Lake		Fish consumption advisory posted		
Lyman Lake		Fish consumption advisory posted		
Parker Cyn Lake		Fish consumption advisory posted		
Lakeside Lake	(mg/L) Ntot = 1.9 Ptot = 0.08 Chla = 25	Results compiled into annual mean values. Annual mean exceedences for all three parameters in 2002 and 2003	No noticeable improvements in nitrogen, phosphorus and chlorophyll <i>a</i> results since aeration began in June 2002	
LCR -- Silver Ck	10 NTU	Results range: 54 – 1000 NTU 8 of 8 exceedences (100%) magnitude of median exceedence value (115 NTU) is much greater than 2 fold higher than criteria;	Maximum exceedence occurred at highest streamflow rates; some mid-range exceedences at low flow rates; 1 of 1 SSC sample exceedence	Threatened & Endangered fish (spinedace and humpback chub) species present
Gila River-- Bonita to Yuma	50 NTU	Results range: 0.3 - 10,000 NTU 7 of 24 exceedences (29%) magnitude of median exceedence value (420 NTU) is much higher than 2 fold higher than criteria; 3 exceedences more than 10fold higher than criteria	Some higher turbidity exceedences associated with lower streamflow rates; SSC data shows 1 annual mean and 4 event exceedences of 80 mg/L std.; 7 of 7 sediment samples show 100% fines (<.062	Threatened & Endangered fish (spikedace, loach minnow, razorback sucker) present

Waterbody	Criteria	Summary of results	Other info	Biological info
			mm)	
SF River-hdwtr-NM border	10 NTU	Results range: 5 – 26 NTU 6 of 9 exceedences (67%) magnitude of median exceedence value (21 NTU) is 2 fold higher than criteria	Some higher exceedences associated with lower streamflow rates	Threatened & Endangered fish (loach minnow & razorback sucker) present
Boulder Ck – Unnamed trib to Wilder Ck	Acute Hg diss = 2.4 ug/L; Chronic Hg diss = 0. 01 ug/L	Results range: <0.2 – 3.4 ug/L 6 of 6 chronic samples == 5 of 5 event exceedences; magnitude of exceedences is more than 10 fold above chronic standard; one exceedence above acute standard	Hg TMDL in progress downstream in Alamo Lake As TMDL approved in 2004	
Boulder Ck— Wilder Ck to Copper Ck	Acute Hg diss = 2.4 ug/L; Chronic Hg diss = 0. 01 ug/L	Results range: <0.2 – 3.8 ug/L 3 of 3 chronic event exceedences; magnitude of exceedences is more than 10 fold above chronic standard; one exceedence above acute standard	5 of 12 sediment samples exceedence freshwater guideline (TEL value*) Hg TMDL in progress downstream in Alamo Lake As, Cu, Zn TMDL approved in 2004	
Burro Ck	Chronic Hg diss = 0. 01 ug/L	Results range: <0.2 – 0.8 ug/L 0 acute exceedences; 3 of 3 chronic event exceedences; magnitude of exceedences is more than 10 fold above chronic standard		
Butte Ck	Chronic Hg diss = 0. 01 ug/L	Results range: <0.2 – 1.1 ug/L 0 acute exceedences; 2 of 2 chronic exceedences; magnitude of exceedences is more than 10 fold above chronic standard		
Brewery Ck	A&We Cu diss Varies by hardness	Results range: 26 – 150 ug/L 5 of 5 chronic event exceedences;	Data from 2000, no new data; Cu TMDL in progress in Mule Gulch watershed	

Waterbody	Criteria	Summary of results	Other info	Biological info
Granite Creek	DO >6.0	Results range: 4.3 – 10.8 4 of 5 event exceedences (80%);		
Bear Canyon Lake	pH 6.5- 9.0	Results range: 5.8 – 6.8 4 of 4 event low pH exceedences (100%);		
Rose Canyon Lake	pH 6.5- 9.0	Results range: 6.2 – 9.8 2 of 2 event low pH exceedences; 1 of 1 event high pH exceedences (100%);		
Watson Lake	(mg/L) Ntot = 3.0 DO > 6.0 pH = 6.5 – 9.0	2 of 5 exceedences of pH; 2 of 5 exceedences of total Nitrogen (Ntot); 1 of 5 exceedences of dissolved oxygen (DO); fish kill observed in 2000 when Ntot result was 4.0 mg/L;		
Tonto Cr— hdwtrs to unnamed trib	DO <7.0 mg/L	Results range: 4.9 – 10.8 10 of 86 exceedences (12%); median exceedence value = 6.6 mg/L		
Tonto Cr— hdwtrs to unnamed trib	Nitrogen total 1.0 mean; 3.0 maximum	Results range: 2 annual mean exceedences in 2002		
Tonto Cr— hdwtrs to unnamed trib	Nitrogen total 1.0 mean; 3.0 maximum	Results range: 1 annual mean exceedence in 2002; 1 single sample maximum exceedence in 2002		

*freshwater threshold effect level (TEL = 0.174 mg/kg dry wt.) from Buchman, 1999.